

Development of a Strategic Spatial Sampling Design for the State of Florida

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ABSTRACT

Measuring and mapping soil properties at a landscape scale requires identifying representative sampling locations that capture the underlying soil variability. However, the extreme diversity in soil properties, particularly soil carbon, and the dependence of carbon values on various factors, such as land use and topography/drainage conditions, presents many challenges in developing a sampling design. To assess the variability of soil carbon across a large region requires strategic sampling across ecosystem types with different landscape conditions. Our objectives were to develop a spatial sampling design that targets sampling towards major ecosystem types common in the State of Florida, covers the whole State, and accounts for medium and large-scale variation of soil organic carbon.

We adopted a stratified random sampling design with land use – suborder combinations as strata to represent different ecosystem types. Suborders provide information about soil characteristics as well as drainage conditions, which is an important factor for soil carbon storage. A total of 1,000 sampling points were allocated randomly to strata proportional to their aerial extent. In addition, the following constraints were superimposed onto the sampling strategy: (i) Out of the total 1,000 sampling ~50% of the samples were chosen from the historic Florida Soil Characterization Database within respective land use – suborder strata; (ii) Specialty land uses such as military operations, airports and cemeteries were excluded; (iii) The Greater Everglades area was excluded since it has been mapped recently for assessment of soil carbon; and (iv) Land use – suborder combinations which cover less than 0.05% of the study area were excluded. The sampling design was implemented within the geographic information system ArcGIS in conjunction with random number generator in SPSS.

We used the land use layer developed by Fish and Wildlife Conservation Commission (2003) to derive land use classes. Among the different land uses, pinelands and urban land uses were the major classes covering 19.3 and 11.9% of the study area, respectively. All other classes accounted for less than 10% each. Suborder data were derived from Soil Data Mart (Natural Resources Conservation Service) with major suborders of Aquods, Psamments, Udufts and Aqualfs accounting for 22.4, 13.5, 13.4 and 11.2% of the study area, respectively. All other suborders accounted for less than 10% each.

The x and y coordinates of the selected sampling points were transferred to a global positioning system (Trimble GeoXT) and are now used for field sampling (ongoing project). Each collected soil sample will be analyzed for soil organic carbon and various carbon fractions.

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